HPC Planning

(strategic management, procurement, funding)

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Survey/discuss planning best practices from an HPC perspective for software

- First, what is unique about HPC planning?
- Existing HPC planning best practices
- How is project cost planned, managed, monitored?
- Sustainment funding
- Interagency and international cooperation
- Top challenge - Forecasting requirements
- Other top HPC planning challenges
- New technologies needed for HPC planning?

Practices

Challenges

First, what is unique about HPC Planning?

- There **are** many similarities and differences with industry. Many industries (eg Google, Sun) do SW research.
- Funding source and reward model are different than industry. However, we are expected to leave behind used systems if we expect sustained funding.
  - Quantitative ($) measure of success in industry.

What rules and resources exist for HPC project planning?

- ASCR requires OSS license for government-funded products (slight preference for BSD). And encourage copywriting.
- Risk Grading is important
  - Simulations lead to real-world policy decisions.

What are your best practices?

- Early investment
  - Small-scale: Laboratory LDRD & seed funding.
  - Large-scale: PathForward, Alliances, …
- Investment choices
  - Investment in both software and people are a critical investment choice.
- Planning vehicles
  - Different approaches from regular, external, formal review to Agile programming
- Tracking and metrics to determine use and value inform quantitative planning/investment decisions by developers, facilities, agencies.
- Vendor/Industry Relationships - different models work in different circumstances.
- EVMS too rigid for SW technology innovation.
- Sustainability must be planned for.

Top challenge - Forecasting requirements

- How do you gather requirements and how accurate are they?
  - Science visits, conferences, requirements database, high-level validation, embedded developers, constraintless thinking paired with allocation process, education & negotiation to mitigate unrealizable expectations, exploration of real/underlying requirement, trouble ticket feature requests (don't always work), face-time and fielding complaints, user-centric documentation & implementation plans, use cases
- When and how often do you do this? **Continually**
- Do you use metrics to validate requirement extrapolations?
  - Measurability is a best practice, but…
- Do you follow up to verify the accuracy of the requirements?
  - Alpha-user feedback and real-world use are the best measure of accuracy.

Other top challenges surrounding HPC planning

- Funding gap between R&D and applied use by domain scientists
- Measuring impact on delivered science
  - Measuring use is easier, but non-trivial
- Planning occurs at the component level without cross-cutting requirements and design principles.

What new technologies are needed to help with HPC planning?

- Planning rarely benefits from new technologies.
- Standards (focus on science rather than mechanism)
  - eg. Portable data formats, software bus architectures

What are best practices and tools?

- *Continual and conscious seeking of requirements and user feedback.*
- *Measurement and tracking of use and value to scientists/programs.*
- *Investment in early technologies, people, and infrastructure.*
- *Long-term sustainability must be planned and supported.*

What are the top challenges?

- *Requirements collection & translation into usable code.*
- *Assessing impact of software projects on science and programs.*
- *Vendor and technology unknowns.*
- *Sustainability and funding models.*

What new technologies are needed?

- *None identified.*

Findings and Recommendations

- Most/All sites need improvement to facilitate planning.
- We don't have pay-for-use model.
  - Agencies must be willing to sustain critical SW and fund the projectizing necessary.
- Is a SW sustainability center called for?
  - First line of user support for multiple SW.
- Planning occurs at the component level without cross-cutting requirements and design principles.